

# Meetings

## Stromatolites

Stromatolites were first considered fossils of animal affinities (Hall), later identified as algae (Walcott), and finally recognized as the products of the interaction of physical sedimentation and mats of blue-green algae (Black). Black's work on recent stromatolitic sediments in the Bahamas is the basis for the current interpretation of ancient stromatolites as organo-sedimentary structures composed of particulate sediments and for the modern emphasis on the use of stromatolites as indicators of environment proposed by the classification of Logan, Rezak, and Ginsburg. This historical review of stromatolites was made by Johnson (Colorado School of Mines) at a conference held at The Johns Hopkins University, Baltimore, Maryland, 17–19 February 1967. The conference brought together active workers to discuss their current research and problems in both recent and ancient stromatolites. The group of 22 included participants from Australia, England, Italy, and Canada.

Several participants emphasized the influence of physical sedimentation on stromatolites. Hoffman (Geological Survey of Canada and Johns Hopkins) described a thick sequence of Precambrian stromatolites from the East Arm of Great Slave Lake, Northwest Territories of Canada. With magnificent bedding-plane exposures exhumed by glaciation, Hoffman was able to show for the first time a correspondence between current direction recorded by physical sedimentary structures, ripple marks, and cross-bed dip directions, and the form and orientation of algal stromatolites. An example of the combined organic and sedimentary aspects of stromatolites was described by Gebelein (Johns Hopkins). His study of a subtidal locality in Bermuda showed that the distribution, form, and laminations of small contemporary algal biscuits are controlled by physical sedimenta-

tion and algal growth. An algal mat develops preferentially on the crest of small ripples and selectively binds particulate sediment finer than that surrounding it. The individual laminations are diurnal, a result of the coincidence of algal growth in daylight with water containing sediment from ebb tide. Another example of the effect of the current regimen on the form and structure of recent stromatolites was given by Ginsburg (Johns Hopkins). He described elongated "bars," draped with columnar stromatolites similar to those in some ancient bioherms, from the high intertidal flats of The Wash in England and from a tidal channel in the Bahamas. Kendall (Imperial College and University of Texas) described the extensive recent stromatolitic sediments of The Trucial Coast of the Persian Gulf. The surface form of the algal mat is determined by the extent of desiccation that is controlled by position in the tide zone. Logan (University of Western Australia) reviewed the diagenesis of recent stromatolitic sediments in Shark Bay. Skeletal and nonskeletal grains are altered to cryptocrystalline aragonite in the intertidal zone and cemented by the same material. The end product of this kind of diagenesis is a cryptocrystalline rock with little or no evidence of its original sand-sized particles.

The organic aspects of stromatolites were emphasized by several participants. Golubić (Yale) described the complex vertical biological stratifications of algal mats composed of many species compared with the regular and distinctive laminations of stromatolitic heads made by a single species. These observations prompted Golubić and Fischer (Princeton) to question the extent to which algae determine the form and structure of ancient stromatolites rather than purely physical sedimentation. Rezak (Shell Development Company) and Wray (Marathon Oil) described examples of what in outcrop

appeared to be stromatolites of particulate sediment, but on closer inspection were found to be fossil algae with distinct tubular structure. Even the classic Cambrian bioherm on the Llano River in Texas may consist largely of *Girvanella*-like fossil algae rather than laminae of particulate sediments, according to Rezak.

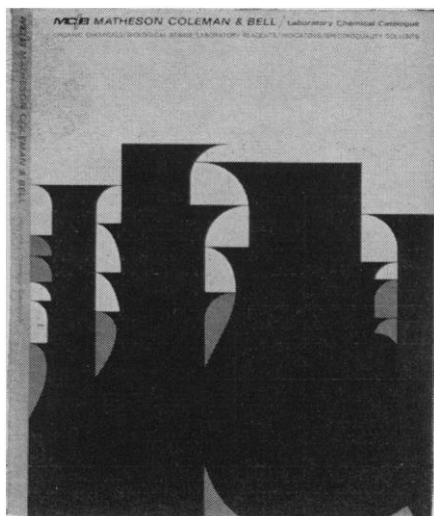
Stromatolites have also been used as indices of environments. Laporte (Brown) reviewed the zonal pattern of stromatolites in the Lower Devonian of New York. He showed a convincing correlation between stromatolite form and depth determined by the independent sedimentary and faunal evidence. D'Argenio (Naples) compared the distribution of stromatolites with major environments deduced from faunal and stratigraphic analysis in the Triassic and Cretaceous of the Apennines. Donaldson (University of West Virginia) reported on a comparison of stromatolites and sedimentary facies from the Lower Ordovician of the Central Appalachians.

McGugan (University of Alberta, Calgary) described some preliminary attempts to discern rhythms in the variation of thickness of the laminations in ancient stromatolites. He hopes that ancient stromatolites may contain some record of the number of days in the year similar to records thought to be preserved in some solitary corals. Brunskill (Cornell) described a survey of a fresh water algal bioherm from Green Lake in New York. His work shows that the algae have surprisingly little effect on the actual precipitation of calcium carbonate in this particular accumulation, nor do they contribute much to the internal structure.

Fischer (Princeton) questioned the interpretation of ancient stromatolites as analogues of modern intertidal algal mats and heads. He suggested that the decline of the stratigraphic record of stromatolite from abundance in the Precambrian to scarcity in the Cenozoic is the result of: (i) a progressive restriction of the ecologic range of cyanophytes through the competition of highly organized plants and (ii) a decrease in the supersaturation of the sea with respect to calcium carbonate that made preservation of algal mats by precipitation increasing less likely in post-Precambrian time.

Throughout the conference, there was much discussion of the definition of the term "stromatolite" and of the prevailing interpretation of their origin. The current practice of restricting the term to laminated structures of particulate

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sediment deposited under the influence of a mat of algae was questioned by several participants. Laminated structures termed "stromatolites" in the field may consist largely of fossil algae, and both Rezak and Logan showed illustrations of laminated caliche that could easily be misinterpreted as algal stromatolites.

The conference was sponsored by the Department of Geology of Johns Hopkins University with support from the Shell Companies Foundation.

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## Calendar of Events

### Courses

**Bio-Medical Telemetry.** Applications and Techniques, Boston Univ., 27-30 Sept. Intended for scientists, physicians, and engineers. Fee: professional, \$125; student, \$60. (Bio-Medical Telemetry Course, Office of Conference Development, Metrocenter, Boston Univ., 755 Commonwealth Ave., Boston, Mass. 02215)

**Source Sampling and Analysis of Sulfur Oxides.** Cincinnati, Ohio, 1-4 Aug. Intended for engineers and chemists. (Chief, Training Program, National Center for Air Pollution Control, 4676 Columbia Parkway, Cincinnati 45226)

**Computer-Aided Integrated Circuit Design.** Stevens Inst. of Technology, 11-15 Sept. Intended for engineers, physicists, and applied mathematicians. Fee: \$200. *Deadline:* 1 Aug. (G. J. Herskowitz, Dept. of Electrical Engineering, Stevens Inst. of Technology, Hoboken, N.J. 07030)

**Inflammatory Diseases of the Eye.** San Francisco, 5-9 Sept. (S. M. Farber, Continuing Education in Health Sciences, Univ. of California, San Francisco Medical Center, San Francisco 94122)

**Nonlinear Estimation.** Chicago, 11-12 Aug. Sponsored by Chemical Div., American Soc. for Quality Control. (F. Medgin, Research and Development Center, Swift and Company, Exchange and Packers Aves., Chicago, Ill. 60609)

**Engineering with Adhesives.** Hopatcong, N.J., 13-17 Nov. Fee: \$200. (L. S. Buchoff, Saul Gordon Associates, P.O. Box 566, Hopatcong 07843)

**General Practice of Hospital Pharmacy.** Chicago, 13-18 Aug. Intended for community pharmacists serving small hospitals and extended care facilities. Fee: \$85. (American Soc. of Hospital Pharmacists, Dept. of Education and Training, 4630 Montgomery Ave., Washington, D.C. 20014)

**Scientific Photography for Research and Engineering.** Hopatcong, N.J. 14-18 Aug. Instruction in techniques of photography and their application to scientific research, development, and engineering. Fee: \$200. (D. W. Mayer, Program Coordinator, Saul Gordon Associates, P.O. Box 566, Hopatcong 07843)

# Personnel Placement

## POSITIONS WANTED

**Peace Corps Volunteer** returning from West Africa 20 August. Young man desires position in scientific or educational firm. Biology major B.A. English-Chemistry minors, experienced in photography. Norman Meyn, 700 Juniper Road Glenview, Ill. 60025. X

**Position Teaching/Research,** pharmacology, physiology, microbiology, Ph.D., veteran, young, post-doctoral training; experienced; publications, Box 513, SCIENCE. 7/21

## POSITIONS OPEN

### POSITIONS OPEN

**Biochemist** skilled in radioisotope technique to work with groups studying radiolabelled brain constituents of animals and excretion of labelled indole compounds of human beings. Also biochemist skilled in chromatographic techniques to work with group studying urinary constituents of human beings. Write H. E. Himwich, M.D., Research Hospital, Galesburg, Illinois 61401.

**BIOLOGIST,** Ph.D. or M.S. to teach undergraduate general biology including lecture and laboratory, beginning Sept. 1967. Salary \$5000 to \$9000 for 9 months. Apply to **Chairman, Department of Biology, Xavier University, Cincinnati, Ohio 45207.**

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Box 516, SCIENCE.

**Postdoctoral position** available in biochem/biophysics to study surface chemistry of cells in relation to immunology. Salary—\$7,000-\$9,000. Apply: **Dr. David J. Wilkins, New England Institute for Medical Research, Box 308, Ridgefield, Connecticut 06877, U.S.A.**

## ELECTRON MICROSCOPY TECHNICIAN

For basic medical research program. College graduate with major in Biology or related field. Two years of direct experience in electron microscopy. Ability to supervise the work of others. Excellent benefits and working conditions. Send complete resume with approximate salary requirement to: Director of Personnel, **UNIVERSITY OF PENNSYLVANIA, 3025 Walnut Street, Philadelphia, Pa. 19104.** An equal opportunity employer.